

1 **CLAIMS:**

2 1. A method for measuring bandwidth between two entities on a
3 network, the method comprising:

4 receiving at least one first non-compressible packet having measurable
5 characteristics;

6 calculating bandwidth based upon, at least partially, characteristics of the
7 first non-compressible packet.

8
9 2. A method as recited in claim 1, wherein the first non-compressible
10 packet is approximately fragmentation-avoidance size.

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12 3. A method as recited in claim 1, wherein the first non-compressible
13 packet is highly entropic.

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15 4. A method as recited in claim 1, wherein the first non-compressible
16 packet is formatted for TCP.

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18 5. A method as recited in claim 1, wherein the first non-compressible
19 packet is formatted for UDP.
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1 9. A method as recited in claim 1 further comprising:
2 storing result of calculating bandwidth within a list of recent bandwidth
3 measurements;

4 finding a statistical derivation from such list, such derivation representing a
5 most likely actual bandwidth between the two entities.

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7 10. A method as recited in claim 1 further comprising:
8 storing result of calculating bandwidth within a list of recent bandwidth
9 measurements;

10 finding a median of such list, such median representing a most likely actual
11 bandwidth between the two entities.

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13 11. A program module having computer-executable instructions that,
14 when executed within a computing operating environment at an application layer,
15 performs the method as recited in claim 1.

16
17 12. A computer-readable medium having computer-executable
18 instructions that, when executed by a computer, performs the method as recited in
19 claim 1.

13. A method for measuring bandwidth between two entities on a network, the method comprising:

receiving a first non-compressible packet;
receiving a second non-compressible packet;
calculating bandwidth based upon the first and second non-compressible packets.

14. A method as recited in claim 13, wherein bandwidth (bw) is calculated, during the calculating, by this formula:

$$bw = \frac{PS}{t_3 - t_1}$$

15. A method as recited in claim 13, wherein the first and second non-compressible packets are approximately fragmentation-avoidance size.

16. A method as recited in claim 13, wherein the first and second non-compressible packets are highly entropic.

17. A method as recited in claim 13, wherein the first and second non-compressible packets are formatted for TCP.

1 18. A method as recited in claim 13, wherein the first and second non-
2 compressible packets are formatted for UDP.

3
4 19. A method for measuring bandwidth between two entities on a
5 network, the method comprising:

6 sending at least one first non-compressible packet;

7 receiving a bandwidth calculation based upon, at least partially,
8 measurements related to the first non-compressible packet.

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10 20. A method as recited in claim 19, wherein the first non-compressible
11 packet is approximately fragmentation-avoidance size.

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13 21. A method as recited in claim 19, wherein the first non-compressible
14 packet is highly entropic.

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16 22. A method as recited in claim 19, wherein the first non-compressible
17 packet is formatted for TCP.

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19 23. A method as recited in claim 19, wherein the first non-compressible
20 packet is formatted for UDP.

1 24. A method as recited in claim 19 further comprising sending a
2 second non-compressible packet immediately after sending the first packet and
3 before receiving a bandwidth calculation, wherein the first and second packets are
4 equivalent in size.

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6 25. A method as recited in claim 19, after the receiving, further
7 comprising:

8 selecting a file formatted for a given bandwidth that is equal to or less than
9 the bandwidth calculation;

10 sending such file.

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12 26. A method as recited in claim 19, after the receiving, further
13 comprising:

14 selecting a subfile formatted for a given bandwidth that is equal to or less
15 than the bandwidth calculation;

16 sending such subfile.

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18 27. A method as recited in claim 19, before the sending, further
19 comprising selecting the first non-compressible packet from a set of differing non-
20 compressible packets.

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22 28. A method as recited in claim 19, before the sending, further
23 comprising generating the first non-compressible packet.
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1 **29.** A computer-readable medium having computer-executable
2 instructions that, when executed by a computer, performs the method as recited in
3 claim 19.
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5 **30.** A method for measuring bandwidth between two entities on a
6 network, the method comprising:
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8 sending a first non-compressible packet;

9 sending a second non-compressible packet immediately after the sending of
10 the first packet.
11

12 **31.** A method as recited in claim 30 further comprising receiving a
13 bandwidth calculation based upon measurements related to the first and second
14 non-compressible packets.
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16 **32.** A method as recited in claim 30, wherein the first and second non-
17 compressible packets are approximately fragmentation-avoidance size.
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19 **33.** A method as recited in claim 30, wherein the first and second non-
20 compressible packets are highly entropic.
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22 **34.** A method as recited in claim 30, wherein the first and second non-
23 compressible packets are formatted for TCP.
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1 35. A method as recited in claim 30, wherein the first and second non-
2 compressible packets are formatted for UDP.

3
4 36. A computer-readable medium having computer-executable
5 instructions that, when executed by a computer, performs the method as recited in
6 claim 30.

7
8 37. A method of approximating a bandwidth between two entities on a
9 network, the method comprising:

10 generating a list of entries, each entry containing a recent bandwidth
11 measurement;

12 each measurement being based upon a packet-pair bandwidth calculation of
13 different pairs of packets.

14
15 38. A method as recited in claim 37 further comprising replacing a
16 measurement in an entry with a most recently calculated measurement.

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18 39. A method as recited in claim 37, wherein the packets, which are the
19 basis for the packet-pair bandwidth calculation, are non-compressible.

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21 40. A method as recited in claim 37, wherein the packets, which are the
22 basis for the packet-pair bandwidth calculation, are highly entropic.
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1 41. A computer-readable medium having computer-executable
2 instructions that, when executed by a computer, performs the method as recited in
3 claim 37.

4
5 ~~42.~~ A computer-readable medium having stored thereon a data structure,
6 comprising:

7 a list of entries, each entry being a recent bandwidth measurements;
8 each entry being based upon a packet-pair bandwidth calculation of
9 different pairs of packets.

10
11 ~~43.~~ A computer-readable medium having computer-executable
12 instructions that, when executed by a computer, perform a method to measure
13 bandwidth between two entities on a network, the method comprising:

14 receiving a first non-compressible packet;
15 receiving a second non-compressible packet;
16 calculating bandwidth based upon the first and second non-compressible
17 packets.

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19 ~~44.~~ A computer-readable medium having computer-executable
20 instructions that, when executed by a computer, perform a method to measure
21 bandwidth between two entities on a network, the method comprising:

22 sending a first non-compressible packet;
23 sending a second non-compressible packet immediately following the
24 sending of the first packet.
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2 ~~45.~~ A computer-readable medium having computer-executable
3 instructions that, when executed by a computer, perform a method to approximate
4 a bandwidth between two entities on a network, the method comprising:

5 generating a list of entries, each entry containing a recent bandwidth
6 measurement;

7 each measurement being based upon a packet-pair bandwidth calculation of
8 different pairs of packets.
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10 ~~46.~~ A modulated data signal having data fields encoded thereon
11 transmitted over a communications channel, comprising:

12 a first packet containing non-compressible data;

13 a second packet following the first packet, the second packet containing
14 non-compressible data.
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16 ~~47.~~ The modulated data signals as recited in claim 46, wherein the first
17 and second packets are approximately fragmentation-avoidance size.
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19 ~~48.~~ The modulated data signals as recited in claim 46, wherein the first
20 and second packets are highly entropic.
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22 ~~49.~~ The modulated data signals as recited in claim 46, wherein the first
23 and second packets are formatted for TCP.
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1 50. The modulated data signals as recited in claim 46, wherein the first
2 and second packets are formatted for UDP.

3
4 ~~51.~~ An apparatus comprising:

5 a processor;

6 a bandwidth measurer executable on the processor to:

7 receive a first non-compressible packet having measurable
8 characteristics;

9 receive a second non-compressible packet having measurable
10 characteristics;

11 calculate bandwidth based upon characteristics of the first and
12 second non-compressible packets.

13
14 ~~52.~~ An apparatus comprising:

15 a processor;

16 a bandwidth measurer executable on the processor to:

17 sending a first non-compressible packet;

18 sending a second non-compressible packet immediately following
19 the sending of the first packet.
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